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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/556,918	11/14/2005	Carl J. Brunnett	PHUS030122US	1574

38107 7590 12/28/2007
PHILIPS INTELLECTUAL PROPERTY & STANDARDS
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EXAMINER	
MIDKIFF, ANASTASIA	

ART UNIT	PAPER NUMBER
2882	

MAIL DATE	DELIVERY MODE
12/28/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/556,918	BRUNNETT, CARL J.	
	Examiner	Art Unit	
	Anastasia Midkiff	2882	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 November 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☒ Claim(s) *7-20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent to Trotel (US 5,022,060) in view of U.S. Patent to Yu (US 6,094,473), and further in view of U.S. Patent to Brunnett (US 4,052,620).

With respect to Claim 1, Trotel teaches a CT scanner (Column 6, Lines 37-44), comprising:

- a support (6) for rotating a radiation source (2) around an examination region (Column 6, Lines 16-26); and
- a radiation detector (4) comprising an ion chamber (Column 2, Lines 20-34) for generating an analog signal that varies with an intensity of radiation traversing the examination region (Column 2, Lines 25-36).

Trotel does not specifically teach a means for converting an analog data signal to a digital data signal including aperiodic pulses varying in frequency with the intensity of the radiation traversing the examination region as the radiation source rotates about the examination region, a means for producing a time signal indicative of data intervals, or a means for determining average radiation intensity in each data interval by counting the

pulses of the digital data signal starting with a digital data signal pulse occurring in a preceding data interval and continuing to a digital data signal pulse occurring in a succeeding data interval.

Yu teaches an x-ray scanner (1) with an ion chamber detector (16), and the method for its use, wherein there is provided:

- a plurality of x-ray detector sensors (30a-c) for generating an analog data signal that varies with an intensity of radiation traversing the examination region;
- a digital frequency modulated output circuit (40) with a converter circuit (44) for converting the analog data signal to a digital data signal including aperiodic pulses varying in frequency with the intensity of radiation traversing the examination region (Abstract, Lines 1-6);
- a means (40, 44, 46, 60, 70) for producing a time signal indicative of data intervals (Column 6, Lines 1-8);
- a means (60, 70, 72) for determining radiation intensity in a data interval including a processor circuit (72) by counting the pulses of the digital data signal in counter circuits (60, 70), starting with a digital data signal pulse occurring in a preceding data interval and continuing to a digital data signal pulse occurring in a succeeding data interval, said intervals stored in the counter register (Column 6, Lines 15-64)

to provide improved signal-to-noise ratio (Column 3, Lines 64-67).

It would have been obvious to one of ordinary skill in the art at the time of the rejection to use the frequency modulated system of Yu in the apparatus and method of Trotel, to improve signal to noise ratio in signals produced during the scanning of Trotel, as demonstrated by Yu (Abstract and Column 3, Lines 64-67), thereby improving image quality.

Trotel and Yu do not teach averaging radiation intensity in each data interval.

Brunnett teaches an x-ray CT scanner (Column 8, Lines 17-19) in which the reconstruction processor (96) includes a comparator (124) that produces average radiation intensity (Column 7, Lines 9-22) from pulse counts collected by a pulse counting circuit (112) for time periods coinciding with primary time period data intervals (Column 6, Lines 65-68, and Column 7, Lines 1-22) to prevent statistical error in data collection due to any variations in extent of the data intervals (Column 5, Lines 43-52, and Column 6, Lines 18-24).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus of Trotel to include the data interval radiation intensity averaging suggested by Brunnett, to improve statistical accuracy of data collection, as suggested by Brunnett (Column 6, Lines 17-28, and Column 7, Lines 55-57) for improved imaging.

With respect to Claim 6, Trotel teaches a method of measuring an intensity of detected radiation in a CT scanner (Column 6, Lines 37-44), the method comprising:

- rotating a radiation source (2) around an examination region (Column 6, Lines 16-26); and,

- generating an analog signal that varies with an intensity of radiation traversing the examination region (Column 2, Lines 25-36).

Trotel does not specifically teach converting an analog data signal to a digital data signal including aperiodic pulses varying in frequency with the intensity of the radiation traversing the examination region, producing a time signal indicative of data intervals, or determining average radiation intensity in each data interval by counting the pulses of the digital data signal starting with a digital data signal pulse occurring in a preceding data interval and continuing to a digital data signal pulse occurring in a succeeding data interval.

Yu teaches a method of detecting radiation with an x-ray scanner (1) with an ion chamber detector (16), wherein the method includes the steps of:

- generating an analog data signal that varies with an intensity of radiation traversing the examination region with a plurality of detector sensors (30a-c);
- converting the analog data signal to a digital data signal including aperiodic pulses varying in frequency with the intensity of radiation traversing the examination region (Abstract, Lines 1-6) by using a digital frequency modulated output circuit (40) with a converter circuit (44);
- producing a time signal indicative of data intervals (Column 6, Lines 1-8); and,
- determining radiation intensity in a data interval including a processor circuit (72) by counting the pulses of the digital data signal in counter

circuits (60, 70), starting with a digital data signal pulse occurring in a preceding data interval and continuing to a digital data signal pulse occurring in a succeeding data interval, said intervals stored in the counter register (Column 6, Lines 15-64)

to provide improved signal-to-noise ratio (Column 3, Lines 64-67).

It would have been obvious to one of ordinary skill in the art at the time of the rejection to use the frequency modulated system of Yu in the apparatus and method of Trotel, to improve signal to noise ratio in signals produced during the scanning of Trotel, as demonstrated by Yu (Abstract and Column 3, Lines 64-67), thereby improving image quality.

Trotel and Yu do not teach averaging radiation intensity in each data interval.

Brunnett teaches a method of detecting radiation in an x-ray CT scanner (Column 8, Lines 17-19) in which the reconstruction processor (96) includes a comparator (124) that produces average radiation intensity (Column 7, Lines 9-22) from pulse counts collected by a pulse counting circuit (112) for time periods coinciding with primary time period data intervals (Column 6, Lines 65-68, and Column 7, Lines 1-22) to prevent statistical error in data collection due to any variations in extent of the data intervals (Column 5, Lines 43-52, and Column 6, Lines 18-24).

It would have been obvious to one of ordinary skill in the art at the time of the invention to further modify the apparatus of Trotel to include the data interval radiation intensity averaging suggested by Brunnett, to improve statistical accuracy of data

collection, as suggested by Brunnett (Column 6, Lines 17-28, and Column 7, Lines 55-57) for improved imaging.

With respect to Claim 2, Yu further teaches that signal producing means includes a digital counter circuit (70) for detecting a start of a first measured data interval and a start of a next data interval (Column 6, Lines 26-40).

With respect to Claim 3, Yu further teaches that determining means further includes:

- a means (70, 72) for storing a first digital data pulse count in a first start data location and storing a first time signal value (74) associated with the first digital data pulse count in a first start time location (70) each time a pulse occurs on the digital data signal until the first measured data interval starts (Column 6, Lines 26-40), and for storing a second digital data pulse count in an end data location and storing a second time signal value (80) associated with the second digital data pulse count in an end time location (72) when the next pulse occurs on the digital data signal after the start of the next data interval is detected (Column 6, Lines 26-46);
- wherein the determining means (70, 72) determines the intensity of the detected radiation for the first measured data interval (Abstract, Lines 1-6).

Further with respect to Claim 3, Brunnett further teaches determining average intensity is achieved by dividing a difference between the pulse counts stored in the

start and end data locations by a difference between the values stored in the start and end time locations (Column 6, Lines 42-68, and Column 7, Lines 1-22).

With respect to Claims 4 and 5, Yu further teaches the converting means further includes:

- a means (44) for adding a minimized offset signal to the analog data signal so that the intensity of the analog signal is such that at least one aperiodic pulse occurs on the digital data signal during each data interval (Column 6, Lines 1-8);
- wherein the first and second data intervals are adjacent to each other (Column 6, Lines 26-46).

Allowable Subject Matter

Claims 7-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

With respect to Claim 7, the prior art of record teaches many of the elements of the claimed invention, including a method of measuring intensity of detected radiation in a CT scanner, the method comprising: rotating a radiation source around an examination region; generating an analog data signal that varies with an intensity of radiation traversing the region; converting the analog data signal to a digital data signal including aperiodic pulses varying in frequency with the intensity of the radiation traversing the examination region as the radiation source rotates about the examination

region; producing a time signal indicative of data intervals; determining average radiation intensity in each data interval by counting the pulses of the digital data signal starting with a digital data signal pulse occurring in a preceding data interval and continuing to a digital data signal pulse occurring in a succeeding data interval, and storing the average radiation intensity; storing a first digital data pulse count in a first start data location and storing a first time signal value in a first start time location each time a pulse occurs on the digital data signal until a first measured data interval starts; detecting a start of the first measured data interval and detecting a start of a next data interval; and determining an average intensity of the detected radiation for the first measured data interval by dividing a difference between the pulse count stored in a first data end data location and the pulse count stored in the first data start location by a difference between the value stored in the end data location and the value stored in the first start time location.

However, prior art fails to teach or fairly suggest the method wherein after said detection of next data interval, storing a second digital data signal pulse count in the end data location and storing a second time signal value in an end time location when the pulse occurs on the digital data signal, and using this second data end time location for determining the average intensity, in the manner required by Claim 7.

With respect to Claim 10, the prior art of record teaches many of the elements of the claimed invention, including a method of measuring intensity of detected radiation in a CT scanner, the method comprising: rotating a radiation source around an examination region; generating an analog data signal that varies with an intensity of

radiation traversing the region; converting the analog data signal to a digital data signal including aperiodic pulses varying in frequency with the intensity of the radiation traversing the examination region as the radiation source rotates about the examination region; producing a time signal indicative of data intervals; adding a minimized offset signal to the analog data signal prior to the converting so that the intensity of the analog data signal is such that at least one aperiodic pulse occurs on the digital data signal; and determining average radiation intensity in each data interval by counting the pulses of the digital data signal starting with a digital data signal pulse occurring in a preceding data interval and continuing to a digital data signal pulse occurring in a succeeding data interval, and storing the average radiation intensity.

However, prior art fails to teach or fairly suggest the method wherein the offset signal insures that the aperiodic pulses occurring on the digital data signal occur every 2-1/2 data intervals, in the manner required by Claim 10.

Claims 8, 9, and 11-20 would be allowable by virtue of their dependency upon Claims 7 and 10.

Response to Arguments

Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent documents to: Kawakami (US 5,155,752), and Brunnett et al. (US 4,008,400) teach apparatuses and methods for improving image quality in an x-ray scanner using data output modulation techniques and/or radiation intensity averaging over data intervals.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anastasia Midkiff whose telephone number is 571-272-5053. The examiner can normally be reached on M-F 7-4.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Glick can be reached on 571-272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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